

**60.45. SOLAR ACCESS PROTECTION****60.45.05. Purpose.**

This ordinance has been developed to provide solar access protection to new development in subdivisions, to new and remodeled single family homes, to structures within single family zoning districts, and to homes which make beneficial use of solar energy.

1. To promote energy conservation and the wise use of the sun as a renewable resource.
2. To implement provisions of the Beaverton comprehensive plan encouraging solar energy.
3. To provide a means of encouraging investment in solar design and solar equipment.

THE FOLLOWING FIGURES ARE REFERENCED THROUGHOUT THE TEXT PERTAINING TO SOLAR ACCESS PROTECTION:

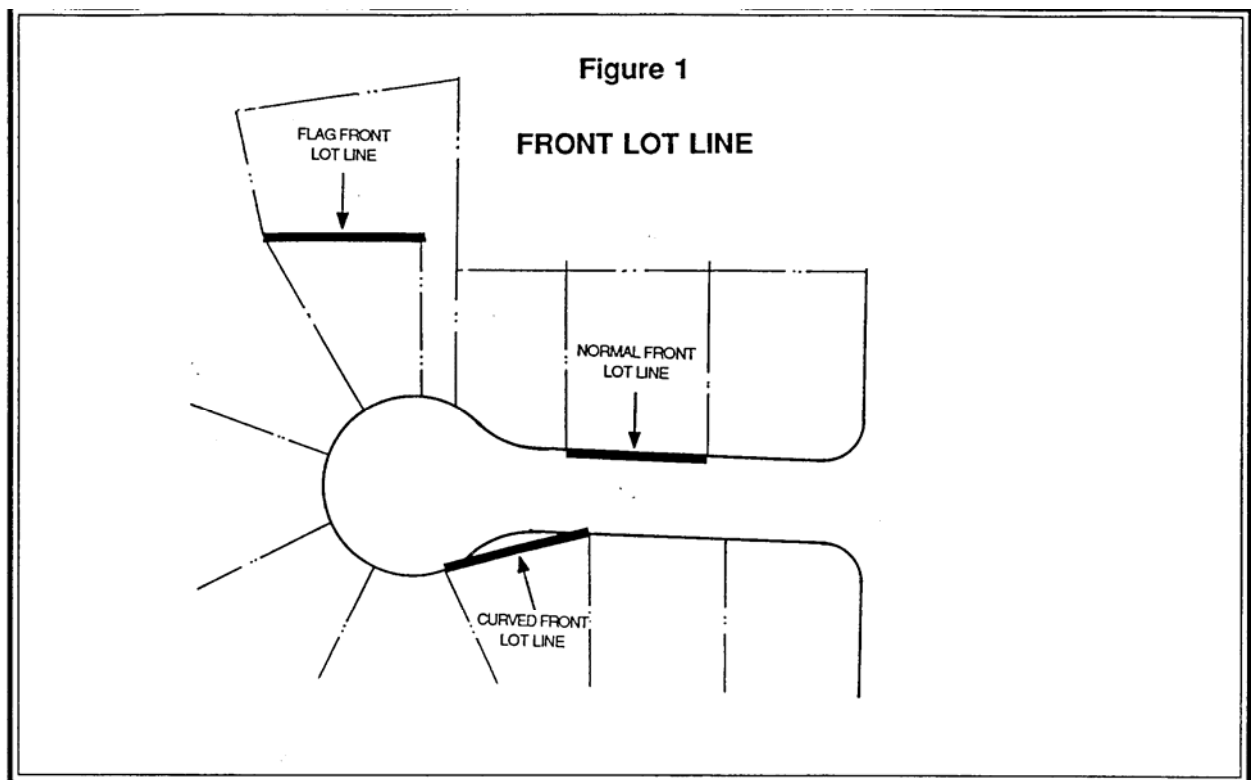


Figure 2

NORTHERN LOT LINE

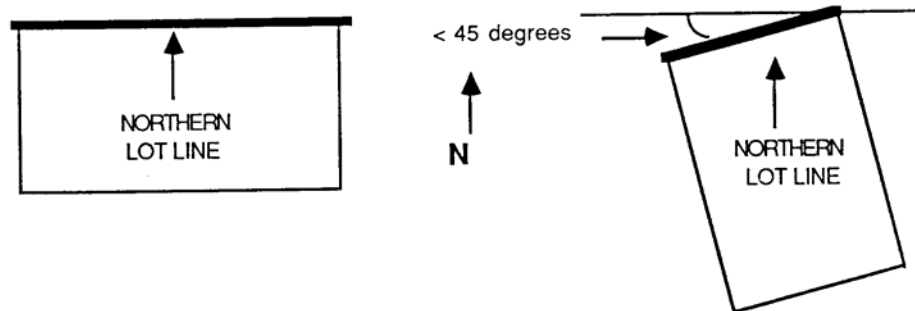


Figure 3

NORTH-SOUTH DIMENSION OF THE LOT

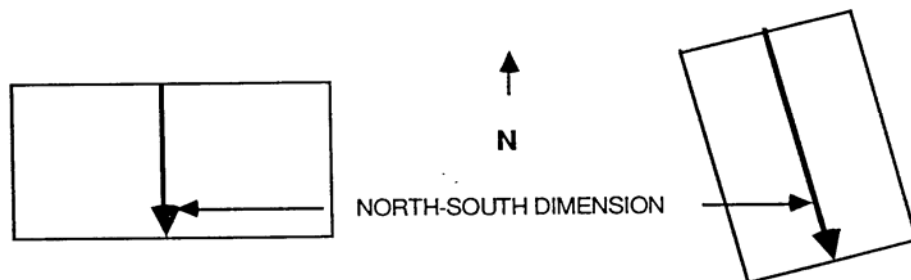


Figure 4

## HEIGHT OF THE SHADE POINT OF THE STRUCTURE

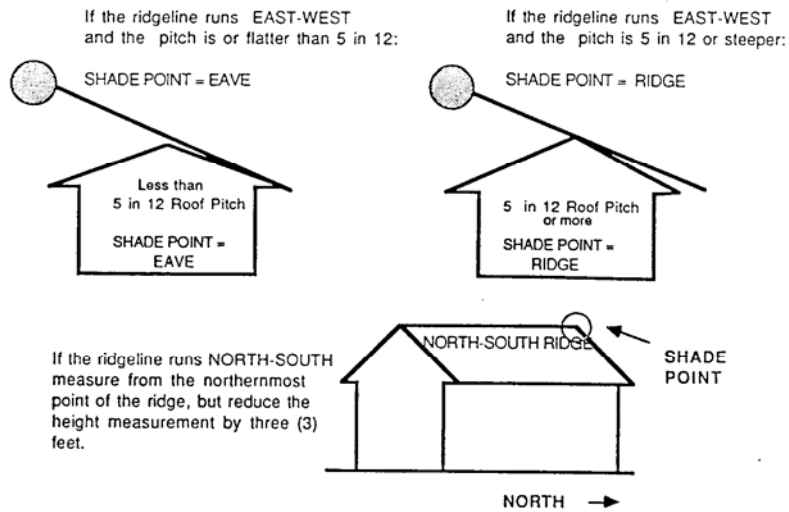
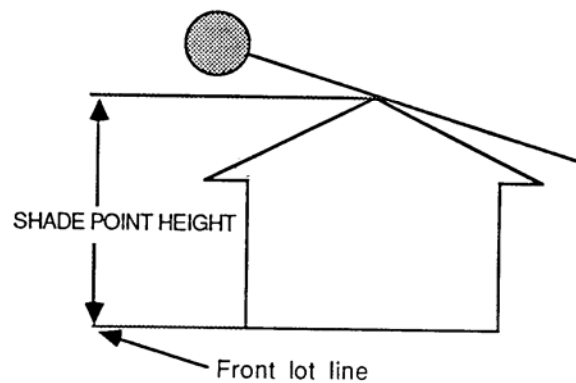


Figure 5

## SHADE POINT HEIGHT

Measure to average grade at the front lot line.



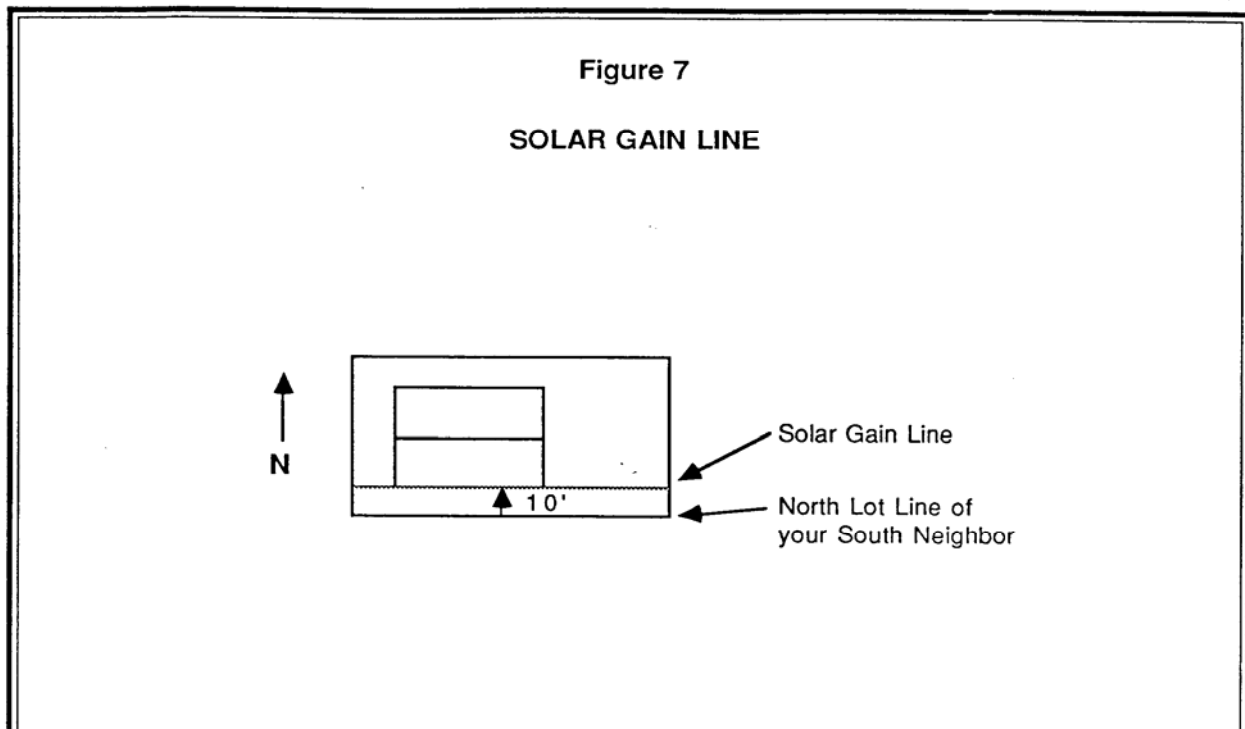
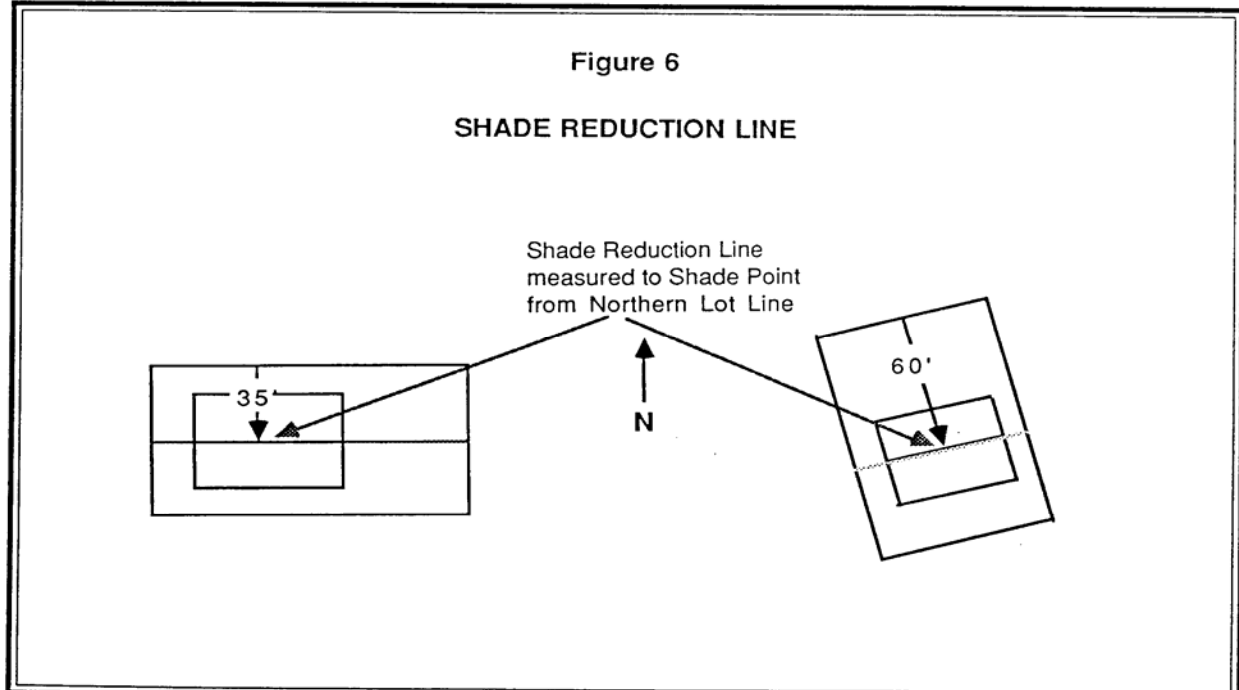
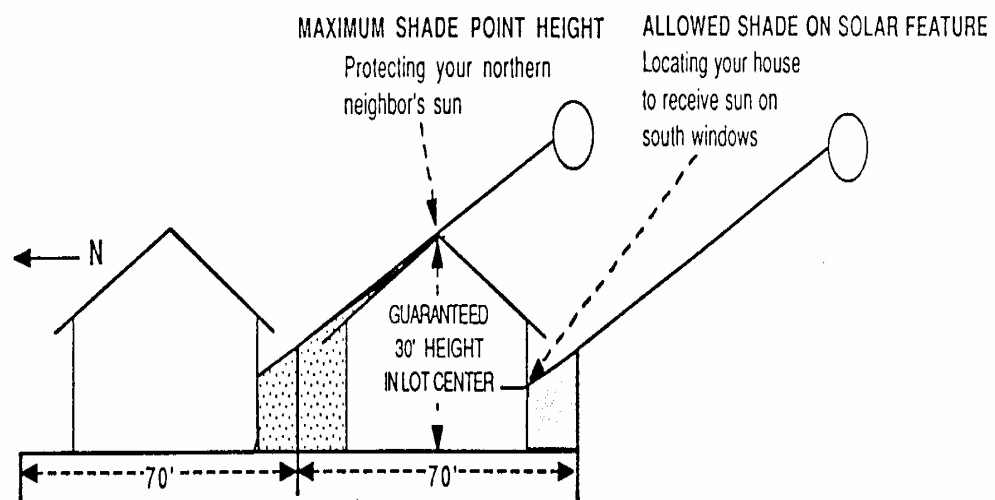


Figure 8

## SOLAR BALANCE POINT STANDARD



Standard Side Setbacks



Reduced Side Setbacks

SETBACK ADJUSTMENTS IF NEEDED  
TO MEET SOLAR STANDARDS

Figure 9

## SOLAR LOT OPTION 1: BASIC REQUIREMENTS

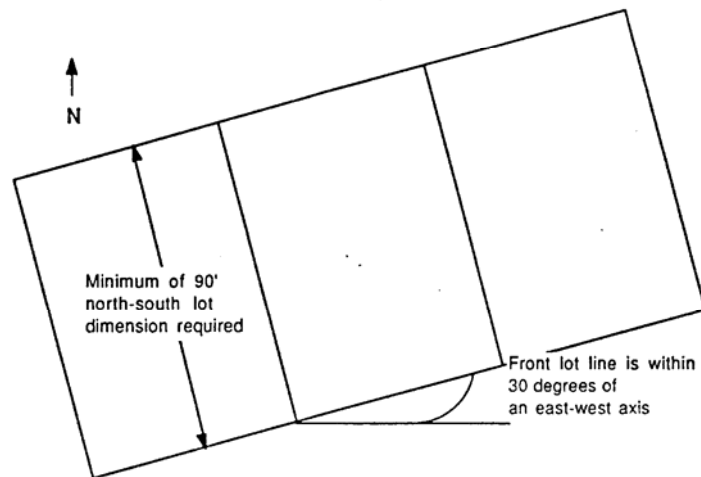


Figure 10

## SOLAR LOT OPTION 2: PROTECTED SOLAR BUILDING LINE

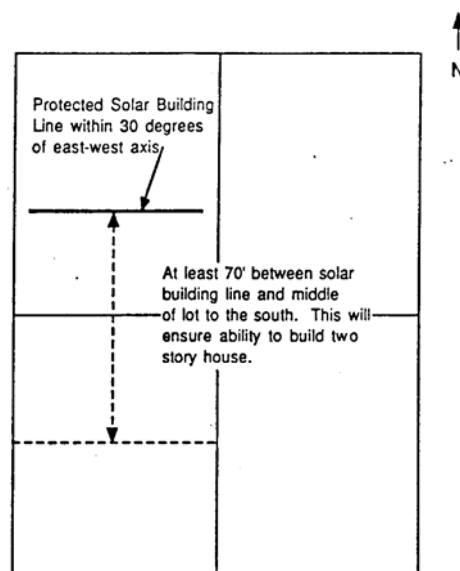


Figure 11

SOLAR ACCESS HEIGHT LIMIT

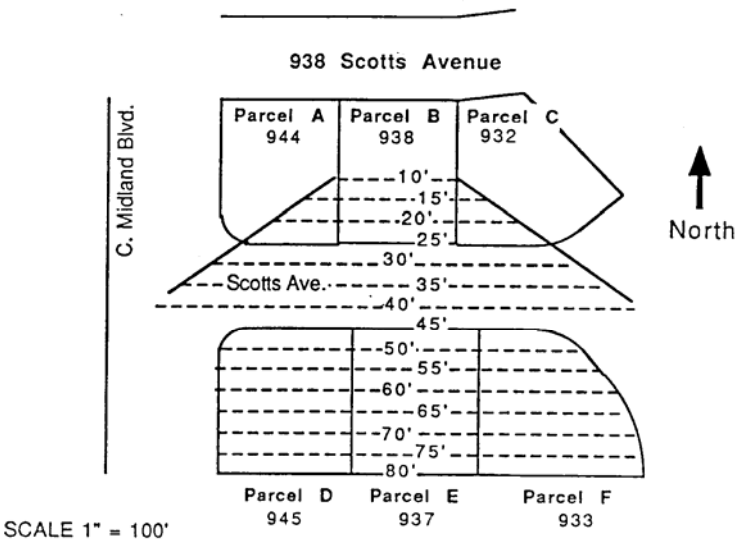
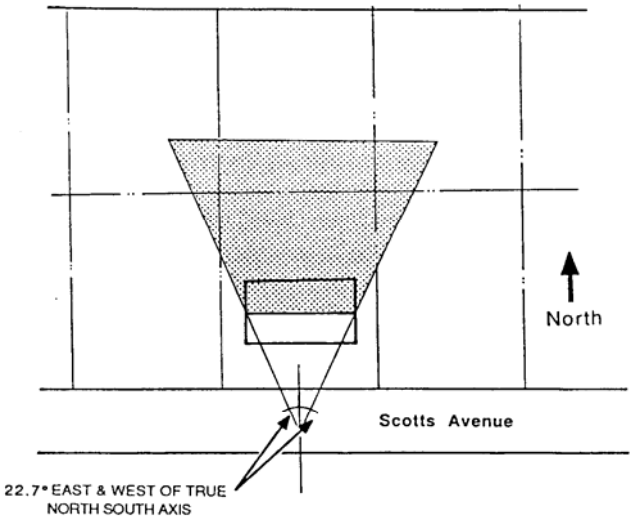


Figure 12

SHADOW PATTERN



**60.45.10. Solar Access for New Development.**

1. Purpose. The purposes of the solar access ordinance for new development are to ensure that land is divided so that structures can be oriented to maximize solar access and to minimize shade on adjoining properties from structures and trees.
2. Applicability. The solar design standard in subsection 3., below, shall apply to subdivisions and partitions in the R-10, R-7 and R-5 zones and for single family detached dwellings in any zone, except to the extent the Director finds that the applicant has shown one or more of the conditions listed in subsections 4. and 5., below, exist, and exemptions or adjustments provided for therein are warranted.
3. Design Standard. At least 80 percent of the lots in a development subject to this ordinance shall comply with one or more of the options in this section.
  - A. Basic Requirement (see Figure 9). A lot complies with this Section if it:
    1. Has a north-south dimension of 90 feet or more; and
    2. Has a front lot line that is oriented within 30 degrees of a true east-west axis.
  - B. Protected Solar Building Line Option (see Figure 10). In the alternative, a lot complies with this Section if a solar building line is used to protect solar access as follows:
    1. A protected solar building line for the lot to the north is designated on the plat, or documents recorded with the plat; and
    2. The protected solar building line for the lot to the north is oriented within 30 degrees of a true east-west axis; and
    3. There is at least 70 feet between the protected solar building line on the lot to the north and the middle of the north-south dimension of the lot to the south, measured along a line perpendicular to the protected solar building line; and



## 60.45.10.3.B.

4. There is at least 45 feet between the protected solar building line and the northern edge of the buildable area of the lot, or habitable structures are situated so that at least 80 percent of their south-facing wall will not be shaded by structures or non-exempt vegetation.
- C. Performance Option. In the alternative, a lot complies with this Section if:
- 1) Habitable structures built on that lot will have their long axis oriented within 30 degrees of a true east-west axis and at least 80% of their ground floor south wall protected from shade by structures and non-exempt trees; or
  - (2) Habitable structures built on that lot will have at least 32% of their glazing and 500 square feet of their roof area which faces within 30 degrees of south and is protected from shade by structures and non-exempt trees.
4. Exemptions from Design Standard. A development is exempt from this Section if the Director finds the applicant has shown that one or more of the following conditions apply to the site. A development is partially exempt from this Section to the extent the Director finds the applicant has shown that one or more of the following conditions apply to a corresponding portion of the site. If a partial exemption is granted for a given development, the remainder of the development shall comply with this Section.
- A. Slopes. The site or a portion of the site for which the exemption is sought, is sloped 20 percent or more in a direction greater than 45 degrees east or west of true south, based on a topographic survey by a licensed professional land surveyor.
  - B. Off-site Shade. The site, or a portion of the site for which the exemption is sought, is within the shadow pattern of off-site features, such as but not limited to structures, topography, or non-exempt vegetation, which will remain after development occurs on the site from which the shade is originating.
    1. Shade from an existing or approved off-site dwelling in a single family residential zone and from topographic features is assumed to remain after development of the site.

**60.45.10.4.B.**

2. Shade from an off-site structure in a zone other than a single family residential zone is assumed to be the shadow pattern of the existing or approved development thereon or the shadow pattern that would result from the largest structure allowed at the closest setback on adjoining land, whether or not that structure now exists.
3. Shade from off-site vegetation is assumed to remain after development of the site if: the trees that cause it are situated in a required setback; or they are part of a developed area, public park, or legally reserved open space; or they are in or separated from the developable remainder of a parcel by an undevelopable area or feature; or they are part of landscaping required pursuant to local law.
4. Shade from other off-site sources is assumed to be shade that exists or that will be cast by development for which applicable local permits have been approved on the date a complete application for the development is filed.

C. On-site shade. The site, or a portion of the site for which the exemption is requested, is:

1. Within the shadow pattern of on-site features such as, but not limited to structures and topography which will remain after the development occurs; or
2. Contains non-exempt trees at least 30 feet tall and more than 6 inches in diameter measured 4 feet above the ground which have a crown cover over at least 80% of the site or relevant portion. The applicant can show such crown cover exists using a scaled survey or an aerial photograph.

If granted, the exemption shall be approved subject to the condition that the applicant preserve at least 50% of the trees that cause the shade that warrants the exemption. The applicant shall file a note on the plat or other documents in the office of the County Recorder binding the applicant to comply with this requirement. The City of Beaverton shall be made a party of any covenant or restriction created to enforce any provision of this ordinance. The covenant or restriction shall not be amended without written City approval.

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5. Adjustments to Design Standard. The Director shall reduce the percentage of lots that must comply with this Section to the minimum extent necessary if it finds the applicant has shown one or more of the following site characteristics apply.
  - A. Density and cost. If the design standard in this Section is applied, either the resulting density is less than that proposed, or on-site site development costs (e.g. grading, water, storm drainage and sanitary systems, and roads) and solar related off-site site development costs are at least 5% more per lot than if the standard is not applied. The following conditions, among others, could constrain the design of a development in such a way that compliance with this Section would reduce density or increase per lot costs in this manner. The applicant shall show which if any of these or other similar site characteristics apply in an application for a development.
    1. The portion of the site for which the adjustment is sought has a natural grade that is sloped 10 percent or more and is oriented greater than 45 degrees east or west of true south based on a topographic survey of the site by a professional land surveyor.
    2. There is a significant natural feature on the site, identified as such in the comprehensive plan or development ordinance, that prevents given streets or lots from being oriented for solar access, and it will exist after the site is developed.
    3. Existing road patterns must be continued through the site or must terminate on-site to comply with applicable road standards or public road plans in a way that prevents given streets or lots in the development from being oriented for solar access.
    4. An existing public easement or right-of-way prevents given streets or lots in the development from being oriented for solar access. [ORD 4071; October 1999]

## 60.45.10.5.

- B. Development amenities. If the design standard in this Section applies to a given lot or lots, significant development amenities that would otherwise benefit the lot(s) will be lost or impaired. Evidence that a significant diminution in the market value of the lot(s) would result from having the lot(s) comply with this Section is relevant to whether a significant development amenity is lost or impaired.
- C. Existing shade. Non-exempt trees at least 30 feet tall and more than 6 inches in diameter measured 4 feet above the ground have a crown cover over at least 80% of the lot and at least 50% of the crown cover will remain after development of the lot. The applicant can show such crown cover exists using a scaled survey of non-exempt trees on the site or using an aerial photograph.
  - 1. Shade from non-exempt trees is assumed to remain if: the trees are situated in a required setback; or they are part of an existing or proposed park, open space, or recreational amenity; or they are separated from the developable remainder of their parcel by an undevelopable area or feature; or they are part of landscaping required pursuant to local law; and they do not need to be removed for a driveway or other development.
  - 2. Also, to the extent the shade is caused by on-site trees on land owned by the applicant, it is assumed to remain if the applicant files in the office of the County Recorder a covenant binding the applicant to retain the trees causing the shade on the affected lots.
- 6. Protection from Future Shade. Structures and non-exempt vegetation must comply with the Solar Balance Point requirements for existing lots (Section 60.45.15) if located on a lot that is subject to the solar design standard in this Section, or if located on a lot south of and adjoining a lot that complies with this Section. The applicant shall file a note on the plat or other documents in the office of the County Recorder binding the applicant and subsequent purchasers to comply with the future shade protection

60.45.10.

7. Process for Approval. Requirements for meeting the provisions of solar access protection shall be processed simultaneously with other application requirements as provided by this ordinance.

**60.45.15. Solar Balance Point.**

1. Purpose. The purposes of this ordinance are to promote the use of solar energy, to minimize shading of structures and accessory structures, and, where applicable, to minimize shading of structures by trees.
2. Applicability. This ordinance applies to an application for a building permit for all structures in R-10, R-7 and R-5 zones and all single family detached structures and accessory structures in any zone, except to the extent the applicant has shown that one or more of the conditions listed in subsection 5. or 6., below, exists, and exemptions or adjustments provided for there are warranted. In addition, non-exempt vegetation planted on lots subject to the provisions of Section 60.45.10.6. for new development shall comply with the shade point height standards as provided in subsections 4. and 5., below, of this ordinance.
3. Solar Site Plan Required. An applicant for a building permit for a structure subject to this ordinance shall submit a site plan that shows the maximum shade point height allowed under subsection 4., below, and the allowed shade on the proposed structure's solar features as provided in subsection 7., below. If applicable, the site plan also shall show the solar balance point for the structure as provided in subsection 8., below.

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4. Maximum Shade Point Height Standard. The height of the shade point shall comply with either subsection 4.A. or 4.B. below.

- A. Basic Requirement. The height of the shade point shall be less than or equal to the height specified in Table A or computed using the following formula. If necessary interpolate between the 5 foot dimensions listed in Table A.

$$H = \frac{(2 \times \text{SRL} - N + 150)}{5}$$

Where: H = the maximum allowed height of the shade point (see Figure 4 and Figure 5);

SRL = shade reduction line (the distance between the shade point and the northern lot line, see Figure 6); and

N = the north-south lot dimension, provided that a north-south lot dimension more than 90 feet shall use a value of 90 feet for this section.

Provided, the maximum allowed height of the shade point may be increased one foot above the amount calculated using the formula or Table A for each foot that the average grade at the rear property line exceeds the average grade at the front property line.

60.45.15.4.

**TABLE A****MAXIMUM PERMITTED SHADE POINT HEIGHT**  
**(In Feet)**

Distance to Shade Reduction Line from northern lot line (in feet)	North-south lot dimension (in feet)												
	100+	95	90	85	80	75	70	65	60	55	50	45	40
<b>70</b>	40	40	40	41	42	43	44						
<b>65</b>	38	38	38	39	40	41	42	43					
<b>60</b>	36	36	36	37	38	39	40	41	42				
<b>55</b>	34	34	34	35	36	37	38	39	40	41			
<b>50</b>	32	32	32	33	34	35	36	37	38	39	40	41	42
<b>45</b>	30	30	30	31	32	33	34	35	36	37	38	39	40
<b>40</b>	28	28	28	29	30	31	32	33	34	35	36	37	38
<b>35</b>	26	26	26	27	28	29	30	31	32	33	34	35	36
<b>30</b>	24	24	24	25	26	27	28	29	30	31	32	33	34
<b>25</b>	22	22	22	23	24	25	26	27	28	29	30	31	32
<b>20</b>	20	20	20	21	22	23	24	25	26	27	28	29	30
<b>15</b>	18	18	18	19	20	21	22	23	24	25	26	27	28
<b>10</b>	16	16	16	17	18	19	20	21	22	23	24	25	26
<b>5</b>	14	14	14	15	16	17	18	19	20	21	22	23	24

- B. Performance Option. The proposed structure, or applicable non-exempt vegetation, will shade not more than 20 percent of the south-facing glazing of existing habitable structure(s), or, where applicable, the proposed structure or non-exempt vegetation comply with Section 60.45.10.3.B. or 60.45.10.3.C. of the solar access provisions for new development. If Section 60.45.10.3.B., Protected Solar Building Line Option, is used, non-exempt trees and the shade point of structures shall be set back from the protected solar building line 2.5 feet for every 1 foot of height of the structure or of the mature height of non-exempt vegetation over 2 feet.

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5. Exemption from the Maximum Shade Point Height Standard. The Director shall exempt a proposed structure or non-exempt vegetation from subsections 3. and 4., above, of this ordinance if the applicant shows that one or more of the conditions in this section exists, based on plot plans or plats, corner elevations or other topographical data, shadow patterns, suncharts or photographs or substantial evidence submitted by the applicant.
  - A. Exempt Lot. When created the lot was subject to the solar access provisions for New Development and was not subject to the provisions of Section 60.45.10.6.
  - B. Pre-existing shade. The structure or applicable non-exempt vegetation will shade an area that is shaded by one or more of the following:
    1. An existing or approved building or structure;
    2. A topographic feature;
    3. A non-exempt tree that will remain after development of the site. It is assumed a tree will remain after development if it: is situated in a building setback required by local ordinance; is part of a developed area or landscaping required by the City, a public park or landscape strip, or legally reserved open space; is in or separated from the developable remainder of a parcel by an undevelopable area or feature; or is on the applicant's property and not affected by the development. A duly executed covenant also can be used to preserve trees causing such shade.
  - C. Slope. The site has an average slope that exceeds 20 percent in a direction greater than 45 degrees east or west of true south based on a topographic survey by a licensed professional land surveyor.



60.45.15.5.

- D. Insignificant benefit. The proposed structure or non-exempt vegetation shades one or more of the following:
    - 1. An undevelopable area; or
    - 2. The wall of an unheated space, such as a typical garage; or
    - 3. Less than 20 square feet of south-facing glazing.
  - E. Public Improvement. The proposed structure is a publicly owned improvement.
6. Adjustments to the Maximum Shade Point Height Standard. The Director shall increase the maximum permitted height of the shade point determined using subsection 4., above, to the extent it finds the applicant has shown one or more of the following conditions exist, based on plans or plats, corner elevations or other topographical data, shadow patterns, suncharts or photographs, or other substantial evidence submitted by the applicant.
- A. Physical conditions. Physical conditions preclude development of the site in a manner that complies with subsection 4., above, due to such things as a lot size less than 3,000 square feet, unstable or wet soils, or a drainage way, public or private easement, or right of way.
  - B. Conflict between the Maximum Shade Point Height and Allowed Shade on the Solar Feature Standards. A proposed structure may be sited to meet the solar balance point standard described in subsection 8., below, or be sited as near to the solar balance point as allowed by subsection 8., below; if:
    - 1. When the proposed structure is sited to meet the maximum shade point height standard determined using subsection 4., above, its solar feature will potentially be shaded as determined using subsection 7., below; and

**60.45.15.6.B.**

2. The application includes a form provided by the City that:
  - a. Releases the applicant from complying with subsection 4., above, and agrees that the proposed structure may shade an area otherwise protected by subsection 4., above.
  - b. Releases the City from liability for damages resulting from the adjustment; and
  - c. Is signed by the owner(s) of the properties that would be shaded by the proposed structure more than allowed by the provisions of subsection 4., above.
3. Before the Building Official issues a permit for a proposed structure for which an adjustment has been granted pursuant to subsection 6.B., above, the applicant shall file the form provided for in subsection 6.B.2. above in the office of the County Recorder with the deeds to the affected properties.

**7. Analysis of Allowed Shade on Solar Feature**

- A. The applicant is exempt from this section if the lot(s) south of and adjoining the applicant's property is exempt from subsection 4., above, of this ordinance.
- B. Applicants shall be encouraged to design and site a proposed habitable structure so that the lowest height of the solar feature(s) will not be shaded by buildings or non-exempt trees on lot(s) to the south. The applicant shall complete the following calculation procedure to determine if the solar feature(s) of the proposed structure will be shaded. To start, the applicant shall choose which of the following sources of shade originating from adjacent lot(s) to the south to use to calculate the maximum shade height at the north property line:
  1. Existing structure(s) or non-exempt trees; or

## 60.45.15.7.B.

2. The maximum shade that can be cast from future buildings or non-exempt trees, based on Table C. If the lot(s) to the south can be further divided, then the north-south dimension shall be assumed to be the minimum lot width required for a new lot in that zone.
- C. The height of the lowest point of any solar feature of the proposed structure shall be calculated with respect to either the average elevation or the elevation at the midpoint of the front lot line of the lot to the south.
- D. The applicant shall determine the height of the shadow that may be cast upon the applicant's solar feature by the source of shade selected in subsection b. by using the following formula or Table B.

$$\text{SFSH} = \text{SH} - (\text{SGL}/2.5)$$

Where: SFSH = The allowed shadow height on the solar feature (see Figure 8).

SH = the height of the shade at the northern lot line of lot(s) to the south as determined in subsection 7.b., above.

SGL = the solar gain line (the distance from the solar feature to the northern lot line of adjacent lot(s) to the south, see Figure 7).

60.45.15.7.D.

**TABLE B****MAXIMUM PERMITTED HEIGHT OF SHADOW AT SOLAR FEATURE**  
**(In Feet)**Distance from  
Solar Gain  
Line to Lot  
Line (In Feet)Allowed Shade Height at Northern Lot Line  
of Adjacent Lot(s) to the South (In Feet)

	22	21	20	19	18	17	16	15	14	13	12
50	2	1									
45	4	3	2	1							
40	6	5	4	3	2	1					
35	8	7	6	5	4	3	2				
30	10	9	8	7	6	5	4	3	2	1	
25	12	11	10	9	8	7	6	5	4	3	2
20	14	13	12	11	10	9	8	7	6	5	4
15	16	15	14	13	12	11	10	9	8	7	6
10	18	17	16	15	14	13	12	11	10	9	8
5	20	19	18	17	16	15	14	13	12	11	10

Table C may be used to determine (SH) in the above formula.

**TABLE C**

	North-south lot dimension of adjacent lot(s) to the south													
	100	95	90	85	80	75	70	65	60	55	50	45	40	
Allowed shade height at the north property line of adjacent lot(s) to south	12	12	12	13	14	15	16	17	18	19	20	21	22	

- E. If the allowed shade height on the solar feature calculated in subsection D. is higher than the lowest height of the solar feature calculated in subsection C., the applicant shall be encouraged to consider any changes to the house design or location which would make it practical to locate the solar feature so that it will not be shaded in the future.

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8. Solar Balance Point. If a structure does not comply with the maximum shade point height standard in subsection 4., above, and the allowed shade on a solar feature standard in subsection 7., above, then the solar balance point of the lot shall be calculated (see Figure 8). The solar balance point is the point on the lot where a structure would be the same from complying with both of these standards.
9. Yard Setback Adjustment. The City shall grant an adjustment to the side, front and/or rear yard setback requirement(s) by a maximum of 50% to build a proposed structure so it complies with either the shade point height standard in subsection 4., above, the allowed shade on a solar feature standard in subsection 7., above, or the solar balance point standard in subsection 8., above, as provided herein (see Figure 8). This adjustment shall apply only if necessary for a structure to comply with the applicable provisions of this ordinance and only so long as the adjustment does not conflict with specific conditions placed upon the property in question, such as easements. The following list illustrates yard adjustments permitted under this section: (ORD 3838)
  - A. R-5 Zone(s):
    1. A front yard setback may be reduced to not less than 15 feet.
    2. A rear yard setback may be reduced to not less than 10 feet.
    3. A side yard setback may be reduced to not less than 3 feet.
  - B. R-7 Zone(s):
    1. A front yard setback may be reduced to not less than 15 feet.
    2. A rear yard setback may be reduced to not less than 10 feet.
    3. A side yard setback may be reduced to not less than 3 feet.
  - C. R-10 Zone(s);
    1. A front yard setback may be reduced to not less than 15 feet.
    2. A rear yard setback may be reduced to not less than 15 feet.

60.45.15.9.C.

3. A side yard setback may be reduced to not less than 5 feet.
10. Application and review process. An application for a building permit shall include the information necessary to meet the provisions of this ordinance. The Building Official shall refer the plan to the Director for approval prior to issuing a building permit, or the Director may delegate this responsibility for review and approval to the Building Official. This review shall consist of determining compliance with those sections reference in subsection 9., above. (ORD 3838)

